Chapter 1
Introduction

1-1. Purpose

The purpose of this manual is to provide information and guidance for the investigation and selection of concrete materials for civil works concrete structures. Elements discussed include design studies and reports, preparation of contract plans and specifications, construction preparation, and concrete construction quality verification. Emphasis is placed on the problems of concrete for hydraulic structures. Roller-compacted concrete, shotcrete, rigid pavements, architectural concrete, and concrete for repairs are not included. These subjects are discussed in EM 1110-2-2006, Roller-Compacted Concrete; EM 1110-2-2005, Standard Practice for Shotcrete; TM 5-822-7, Standard Practice for Concrete Pavements; EM 1110-1-2009, Architectural Concrete; and EM 1110-2-2002, Evaluation and Repair of Concrete Structures, respectively.

1-2. Applicability

This manual is applicable to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having civil works responsibilities.

1-3. References

Applicable references are listed in Appendix A. The most current versions of all references listed in paragraphs A-1 and A-2 should be maintained in all districts and divisions having civil works responsibilities. The references should be maintained in a location readily accessible to those persons assigned the responsibility for concrete materials investigations and concrete construction. Terms used in this document are defined in ACI 116R.

1-4. Explanation of Abbreviations

Abbreviations used in this manual are explained in Appendix B.

1-5. Engineering Responsibilities and Requirements

This paragraph outlines the concrete-related engineering responsibilities and requirements during the development of a civil works project. A summary of these engineering requirements is presented in Table 1-1. Deviations from the requirements described in this paragraph are possible, and such an option as progression from a feasibility report directly to plans and specifications may be permissible. Requests for exceptions or deviations should be made in accordance with ER 1110-2-1150.

a. Reconnaissance phase. Concrete investigation is generally not required during the reconnaissance phase. However, the engineering effort and budget required for concrete investigation during the feasibility phase should be identified and included in the Feasibility Cost-Sharing Agreement (FCSA).

b. Feasibility phase. During the feasibility phase, a preliminary investigation, in accordance with the requirements given in Chapter 2, should be conducted to determine the potential sources and suitability of concrete materials. The engineering effort during this phase should be sufficient so that the baseline cost estimate with reasonable contingency factors for concrete materials can be developed. The potential sources and suitability of concrete materials for the project should be documented in the engineering appendix to the feasibility report (or in a general design memorandum (GDM)) in accordance with ER 1110-2-1150, Engineering and Design for Civil Works Projects. Any special studies required during the preconstruction engineering and design (PED) phase should be identified. These special studies may include, but not be limited to, thermal studies, abrasion-erosion studies, mixer grinding studies, and cavitation studies. The budget and schedules for these special studies and for the concrete report should be included in the project management plan (PMP).

c. Preconstruction engineering and design phase. During the PED phase and prior to the preparation of plans and specifications (P&S), a detailed engineering investigation on concrete materials, including cementitious materials, aggregates, water for mixing and curing, and chemical admixtures, should be conducted in accordance with the requirements given in Chapter 2. Concrete mixture proportioning and concrete construction procedures should be investigated in accordance with pertinent requirements in Chapters 4 and 7, respectively. The results of these investigations should be documented in a concrete/materials design memorandum (DM). The scope and format for the DM will vary depending on the quantities and criticality of concrete involved as outlined in Appendix C. Any special studies identified in the feasibility phase should be carried out during the PED. The concrete plans and specifications should be prepared in accordance with Chapter 5. For any project which includes major concrete construction, a report outlining the engineering considerations and providing

Table 1-1
Concrete-Related Engineering Responsibilities and Requirements

Phase	Engineering Efforts	Document
Reconnaissance	Identify engineering efforts and budget required for concrete investigation during the feasibility phase	Input to FCSA
Feasibility	Preliminary investigations to determine the potential sources and suitability of concrete materials	Engineering appendix to Feasibility Report or GDM
	Identify the engineering requirements, budget, and schedules for the special studies required during PED.	Engineering appendix to Feasibility Report (or GDM) and PMP
PED	Detailed investigations on concrete materials, preliminary mixture proportioning, and concrete construction procedures	Concrete materials DM
	Perform special studies	DM or special study reports
	Prepare concrete P&S 's	P&S
	Prepare engineering considerations and instructions for field personnel	Report
Construction	Develop, adjust, or evaluate mixture proportions	
	Site visits and QV	
	Support for concrete claims and modifications	
	Prepare concrete report	Concrete Report

instruction for field personnel to aid them in the supervision and quality verification (QV) of concrete construction should be prepared in accordance with Chapter 6.

d. Construction phase. Engineering effort during the construction phase generally includes development, adjustment or evaluation of mixture proportions, or both, site visits and QV, support for concrete claims and modifications, and preparation of a concrete report. The concrete construction QV requirements are given in Chapter 9. The guidelines for preparing a concrete report can be found in Chapter 11.

1-6. Delays in Contract Awards

If delays of 5 years or longer occur between the time of completion of the relevant concrete materials DM and the start of construction, it will be necessary to reconfirm the validity of the findings of the DM immediately prior to the issuance of P&S's to prospective bidders. The availability of the types and sources of cementitious materials should be rechecked. If changes have occurred, it may be necessary to conduct tests to determine the suitability of the currently available cementitious materials in combination with the available aggregates and present findings in supplements to

the earlier concrete materials DM. Aggregate sources that have not been used in the period between the aggregate investigations and the preparation for the contract award may be assumed to remain acceptable. Commercial aggregates sources that have been used should be examined to verify that adequate materials remain in the pit or quarry and that the lithology has not changed as materials have been removed. If significant changes have occurred, they should be confirmed petrographically. Depending on the results of the petrographic examination, it may be necessary to reevaluate the aggregate source for suitability. The results of such a reevaluation should be presented as a supplement to the earlier concrete materials DM.